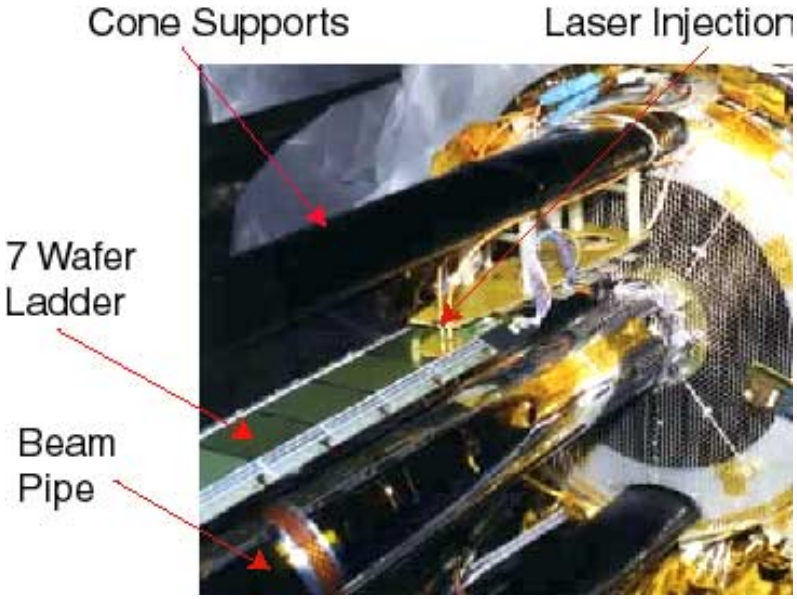
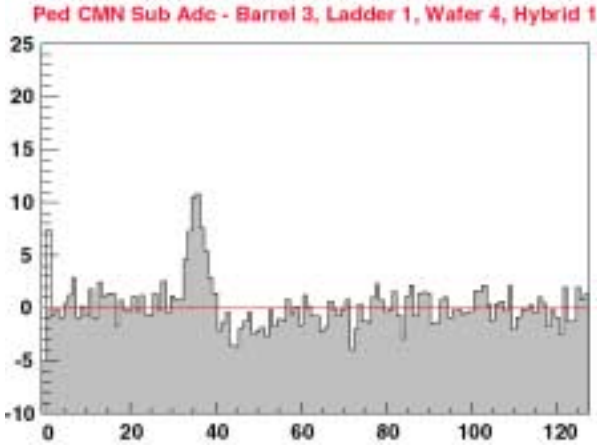
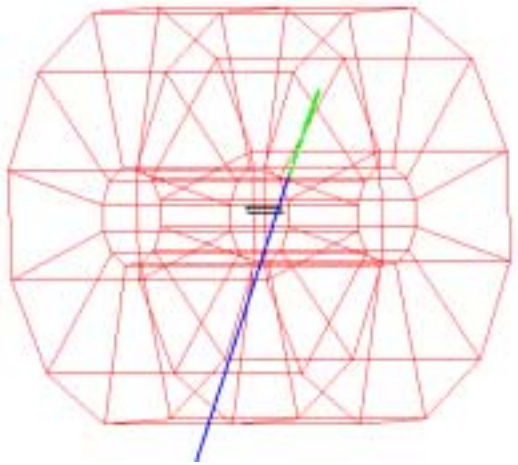
SVT prototype in RHIC

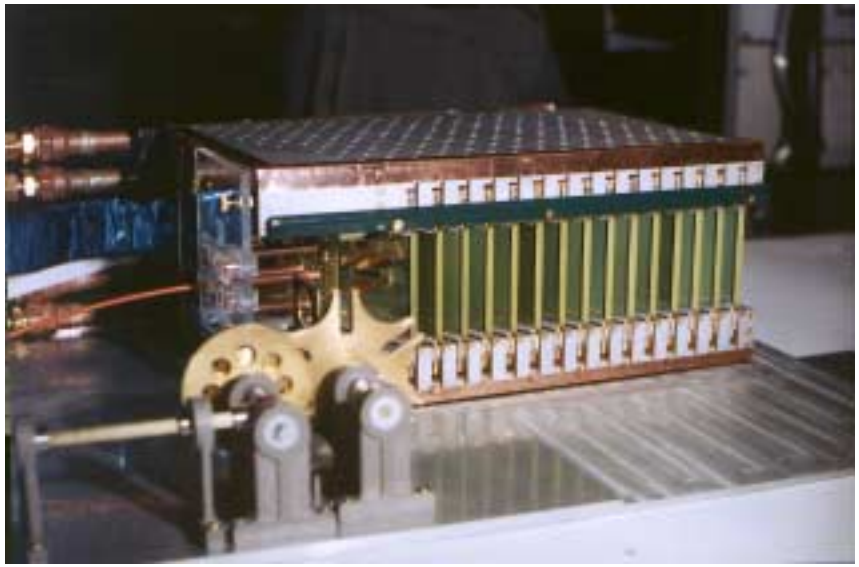


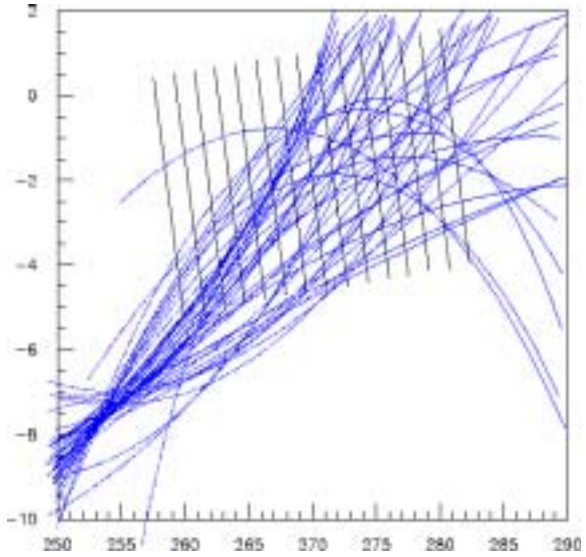
- 7 Wafer ladder installed at 12 o'clock position.
- Fully operational STAR/SVT readout and DAQ system.
- Online software in place.
- Results from Cosmic Ray test run.





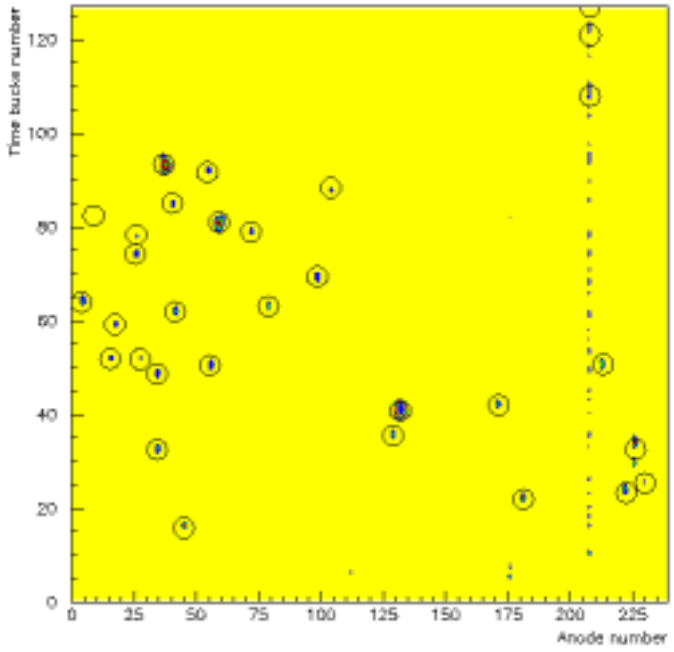
STAR-SDD's in experiment E896

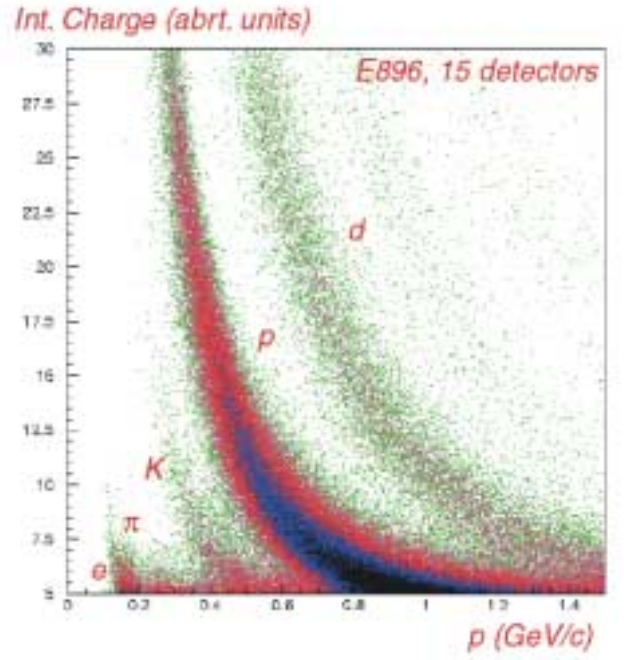




- First charged particle tracking device based on Silicon Drift Detectors operated in high magnetic field (B=6.4T).
- 15 SDD detectors with associated FEE.
- Prototype of SVT-Readout electronics, DAQ and slow controls used.
- Operated for 30 days, at room temperature.

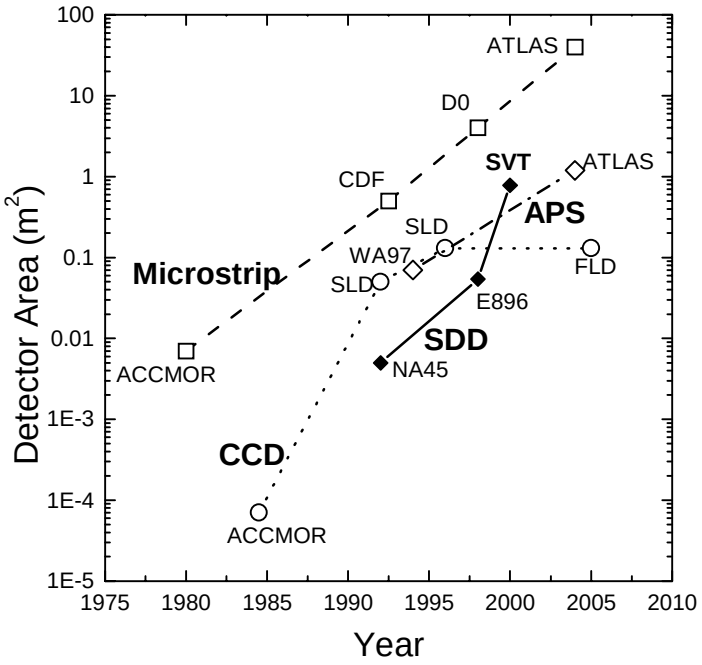
Detector performance results from E896

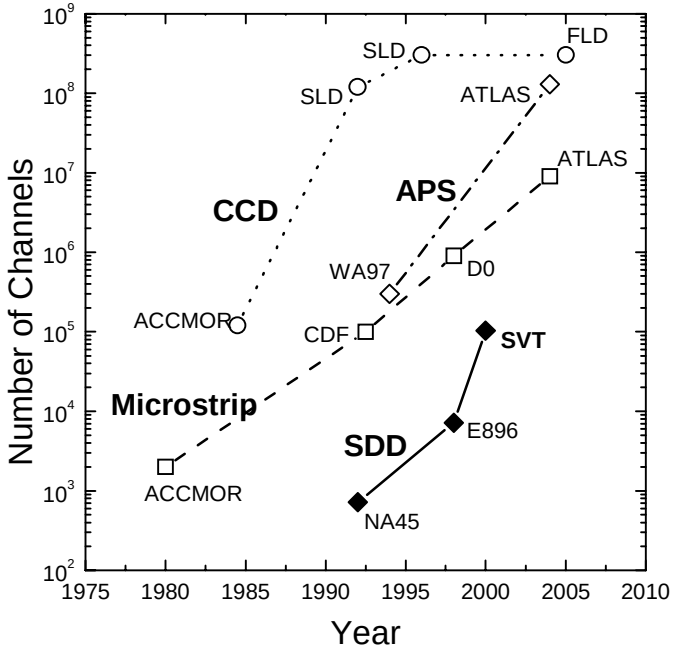




- Average occupancy of 60 hits per wafer, similar to expected in STAR.
- Primary particle track reconstruction efficiency >95%.
- Noise ~750e^-.

SDD compared to similar technologies





Information extracted from: C.J.S. Damerell
"Vertex detectors: The state of the art and future prospects", (1995) SLAC, Standford, USA.

SDD future R & D issues

- Increase detector area, use 6 inch wafer instead of 4 inch:
  Would require higher drift velocity, higher HV, greater guard area.
- Reduce wafer thickness (300μm → 150 μm) to reduce radiation length.
  Need to study effects on drift linearity due to surface effects.
- Higher drift velocity for better position resolution in drift direction.
  Require greater guard area.
- Improve drift region voltage linearity by reducing implanted resistor values
  Increases power dissipation, creating temperature gradients.
- Improve charge injection efficiency for drift velocity calibration by trying different injection line geometry.
- Reduce bulk resistivity for N-type material (3kΩcm →1kΩcm) to increase radiation hardness.
  Have to consider how it affects the potential distribution thus the drift linearity.

SDD Applications

- **Large area Tracking device**
  Proposal for the NLC tracking detector was made based on silicon drift technology to replace gas based 3D tracking systems.

- **Small compact, high occupancy tracking system**
  Small integrated stand alone integrated tracking systems like the SDDA utilized in E896 can be utilized in different environments such as inside high field magnets and space applications.

- **Small single detector, with high granularity and excellent position and energy resolution.**
  The high granularity and low number or readout channels proves useful for imaging applications, such as Medical imaging and digital cameras.
  The low input capacitance allows excellent energy resolution ideal for X-ray applications.

Conclusions:

- **Mature technology.**
  - High production yields.
  - Detector performance well characterized.

- **Operates in high tracking density environment.**
  - Provides unambiguous X-Y measurement.
  - Position resolution of 20 μm.
  - Low interaction length.
  - Maximized active area.

- **Ideal for large area detectors**
  - Good signal to noise ratio (low anode capacitance).
  - Low cost per area due to reduced number of readout channels.

- **STAR/SVT in final construction phase, ready for RHIC year2 running!**